

# GEOTEHNIČKO INŽENJERSTVO

## POMOĆNI DIJAGRAMI, TABLICE I FORMULE ZA ISPIT

dopunjeno za ak.god. 2016/2017

Partial factors for GEO/STR in persistent and transient design situations  
Slopes, footings, and walls (see Chapter 6)

Design Approach 1		Combination 1	↓	↓	↓				
Design Approach 2		Combination 2	↓	↓	↓	↓			
Design Approach 3		↓	↓	↓	↓	↓	↓	↓	↓
Partial factor set			A1	A2	M1	M2	R1	R2	R3
Permanent actions (G)	Unfav'ble	$\gamma_G$	1.35	1.0					
	Favourable	$\gamma_{G,fav}$	1.0	1.0					
Variable actions (Q)	Unfav'ble	$\gamma_Q$	1.5	1.3					
	Favourable	$\gamma_{Q,fav}$	0	0					
Coefficient of shearing resistance ( $\tan \varphi$ )		$\gamma_\varphi$			1.0	1.25			
Effective cohesion ( $c'$ )		$\gamma_{c'}$			1.0	1.25			
Undrained strength ( $c_u$ )		$\gamma_{c_u}$			1.0	1.4			
Unconfined compressive strength ( $q_u$ )		$\gamma_{q_u}$			1.0	1.4			
Weight density ( $\gamma$ )		$\gamma_Y$			1.0	1.0			
Bearing resistance ( $R_v$ )		$\gamma_{R_v}$					1.0	1.4	1.0
Sliding resistance ( $R_h$ )		$\gamma_{R_h}$					1.0	1.1	1.0
Earth resistance ... retaining structures ... slopes		$\gamma_{R_e}$					1.0		1.0
								1.4	
								1.1	
Prestressed anchorages		$\gamma_a$					1.1	1.1	1.0

**Slika 1.** Parcijalni koeficijenti za GEO/STR za djelovanja, parametre materijala i otpore prema EC-7

Partial factors for GEO/STR in persistent and transient design situations  
Piles (see Chapter 13)

Design Approach	Combination 1	↓	↓	↓					
Design Approach 1	Combination 2		↓	↓				↓	
Design Approach 2		↓	↓				↓		
Design Approach 3		↓	↓		↓			↓	
Partial factor set		A1	A2	M1	M2	R1	R2	R3	R4
Actions	$\gamma_F$	See inside front cover							
Material properties	$\gamma_M$								
Base resistance ( $R_b$ )	$\gamma_b$						1.1	1.0	
... driven pile						1.0			1.3
... bored pile						1.25			1.6
... CFA pile						1.1			1.45
Shaft resistance ( $R_s$ )	$\gamma_s$					1.0	1.1	1.0	1.3
Total resistance ( $R_t$ )	$\gamma_t$						1.1	1.0	
... driven pile						1.0			1.3
... bored pile						1.15			1.5
... CFA pile						1.1			1.4
Tensile resistance ( $R_{st}$ )	$\gamma_{st}$					1.25	1.15	1.0	1.6

Partial factors for piles from UK National Annex (see Chapter 13)

Type and amount of static load testing	$\gamma_{Rd}$	Partial resistance factors for Set R4					
		Bored/CFA		Driven		$\gamma_t$	$\gamma_{st}$
		$\gamma_b$	$\gamma_s$	$\gamma_b$	$\gamma_s$		
No explicit SLS check	1.4	2.0	1.6	1.7	1.5	Use $\gamma_b$	2.0
> 1% working piles to 1.5x characteristic load		1.7	1.4	1.5	1.3		1.7
Preliminary load tests	1.2						
Partial factors for Set R1 are all 1.0							

Slika 2. Parcijalni koeficijenti za GEO/STR za otpore pilota prema EC-7

Parametar tla ( X )	simbol	$X_k / X_{srednje}$
Tangens efektivnog kuta trenja	$\tan \varphi'$	0.95
Efektivna kohezija	$c'$	0.80
Nedrenirana čvrstoća	$c_u$	0.85
Edometarski modul	$E_{oed}$	0.80
gustoća	$\rho$	1.00

**Slika 3.** Iskustveni očekivani odnos karakteristične i srednje vrijednosti za tipične geotehničke parametre (Orr i Farrell 1999)

<b>(1) Parcijalni koeficijenti za djelovanja (<math>\gamma_F</math>)</b>					
Djelovanja		simbol	EQU	UPL	HYD
trajna	nepovoljna (destabilizirajuća)	$\gamma_G$	1.1	1	1.35
	povoljna (stabilizirajuća)	$\gamma_G$	0.9	0.9	0.9
prolazna (povremena)	nepovoljna (destabilizirajuća)	$\gamma_Q$	1.5	1.5	1.5
	povoljna (stabilizirajuća)	$\gamma_Q$	0	0	0

**Slika 4.** Parcijalni koeficijenti za EQU, UPL i HYD za djelovanja prema EC-7

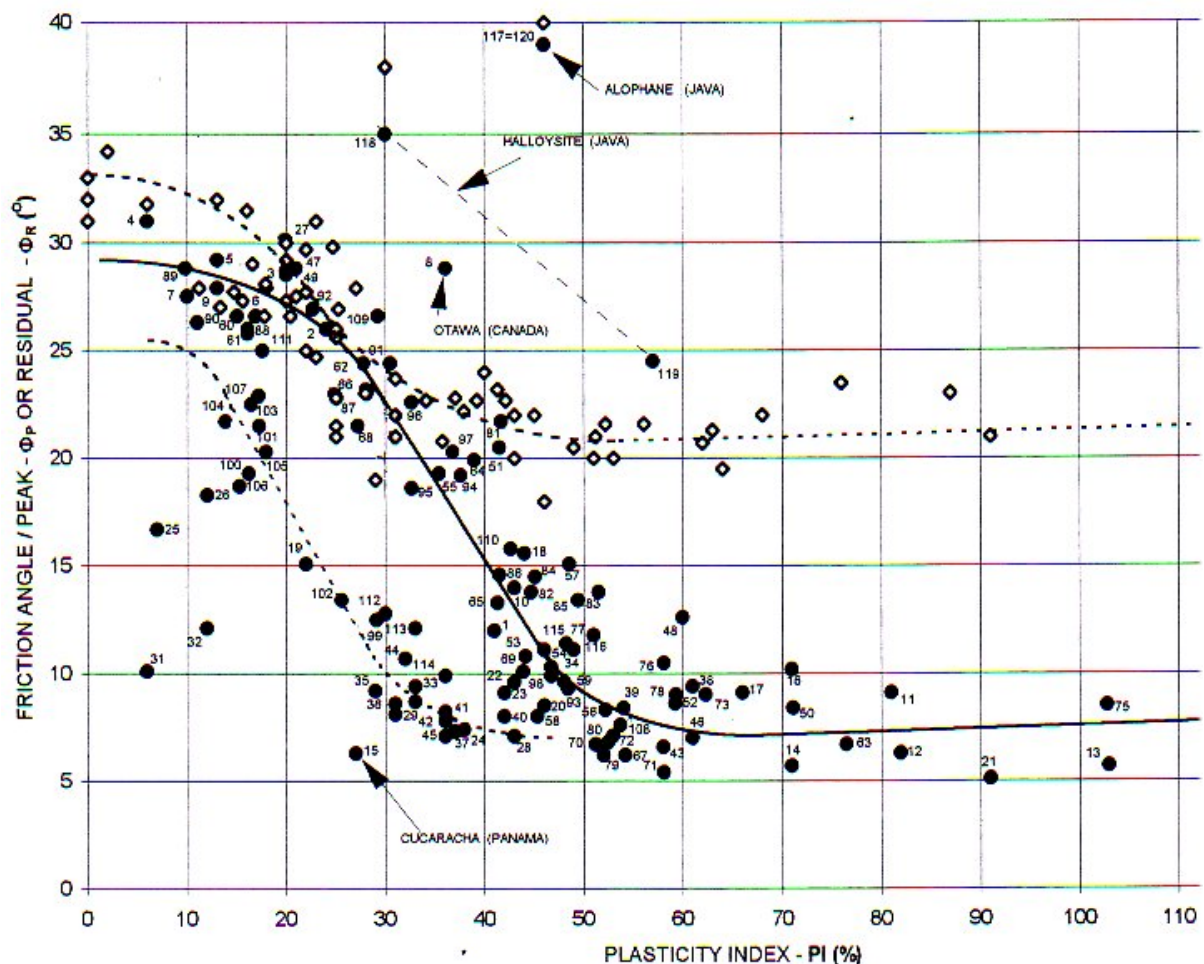
<b>(2) Parcijalni koeficijenti za geotehničke parametre (<math>\gamma_M</math>) i otpornosti (<math>\gamma_R</math>)</b>			
Svojstvo	simbol	EQU	UPL
tangens efektivnog kuta trenja	$\gamma_{\varphi'}$		1.25
efektivna kohezija	$\gamma_{c'}$		1.25
nedrenirana i jednoosna čvrstoća	$\gamma_{cu}$ i $\gamma_{qu}$		1.4
gustoća	$\gamma_{\rho}$		1
vlačna otpornost pilota	$\gamma_{s,t}$		1.4
otpornost sidra	$\gamma_a$		1.4

**Slika 5.** Parcijalni koeficijenti za EQU, UPL i HYD za parametre materijala, prema EC-7



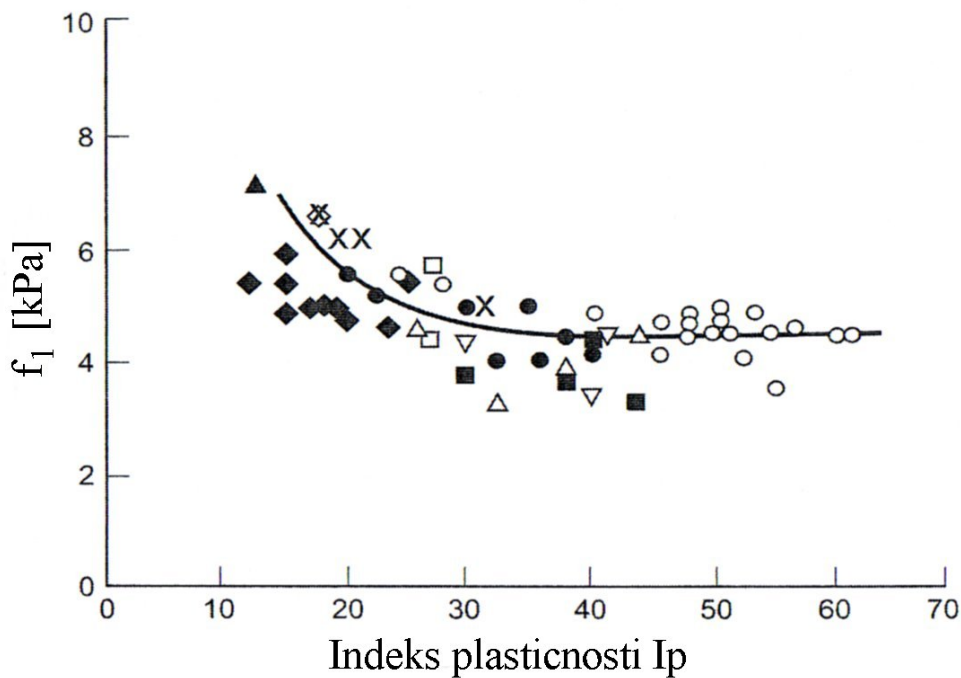
vrsta materijala	N <sub>60</sub>	opis	gustoća tla [t/m <sup>3</sup> ]	
			saturirano	suho
pijesak	0 – 4	vrlo rahli	1,7 – 1,8	1,3 – 1,4
	4 – 10	rahli	1,8 – 1,9	1,4 – 1,5
	10 – 30	srednje zbijen	1,9 – 2,1	1,5 – 1,8
	30 – 50	zbijen	2,0 – 2,2	1,7 – 2,0
	> 50	vrlo zbijen	2,2 – 2,3	2,0 – 2,2
glina	0 – 4	vrlo meka	1,6 – 1,7	0,9 – 1,1
	4 – 8	meka	1,7 – 1,9	1,1 – 1,4
	8 – 15	srednje meka	1,8 – 2,2	1,3 – 1,9
	15 – 30	kruta	1,9 – 2,3	1,8 – 1,9
	30 – 60	vrlo kruta		
	> 60	'čvrsta'		

Slika 6. Procjena gustoće tla ovisno o izmjerenom broju udaraca SPT-a N<sub>60</sub>.

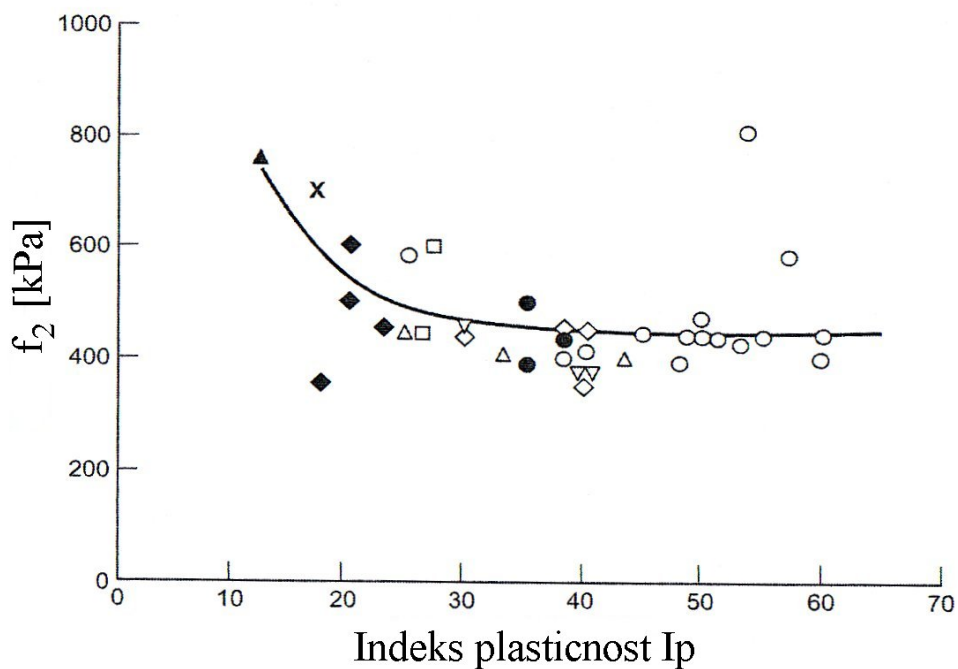


Slika 7. Vršni i rezidualni kut unutarnjeg trenja za sitnozrnate materijale ovisno o indeksu plastičnosti (Ortolan 2009).

a)  $c_u (kPa) = f_1 N_{60}$



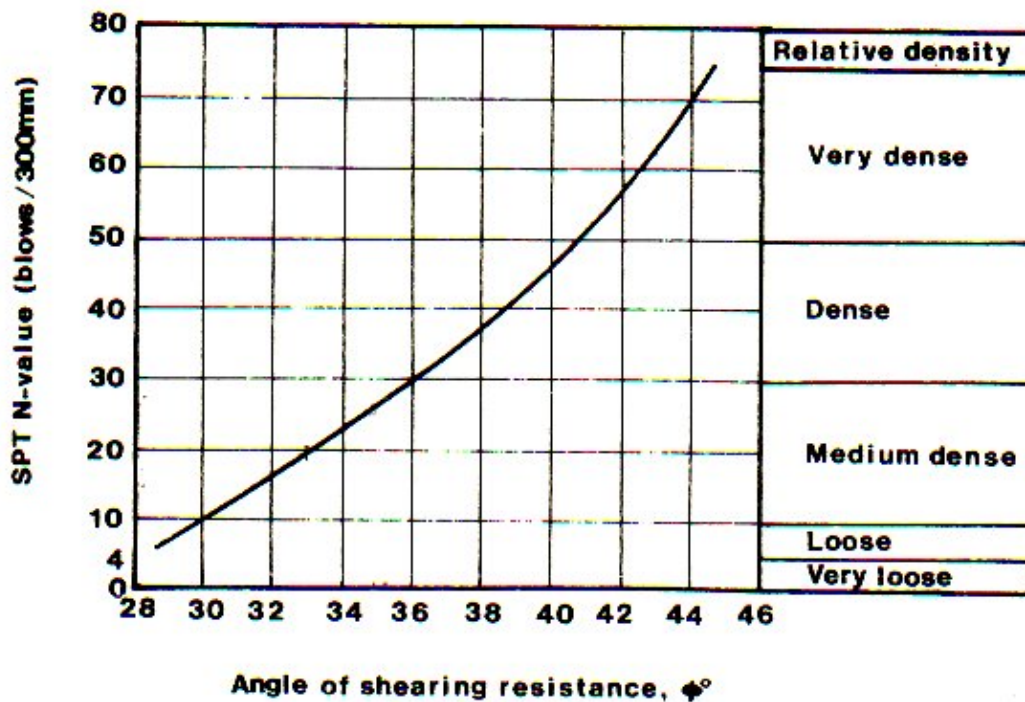
b)  $E(kPa) = f_2 N_{60}$



**Slika 8.** Preporuke za određivanje čvrstoće i krutosti gline (Clayton, 1995). a) nedrenirana čvrstoća  $c_u$ ; b) Youngov modul elastičnosti  $E$ . ( $I_p$  – Indeks plastičnosti gline).

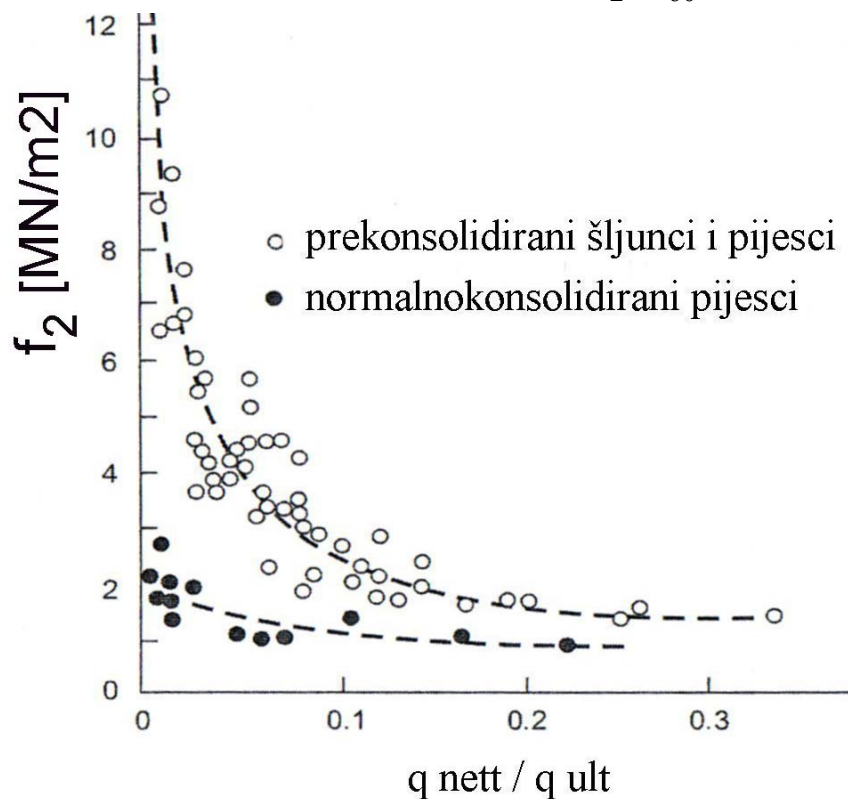
a)

$$\varphi(SPT)$$

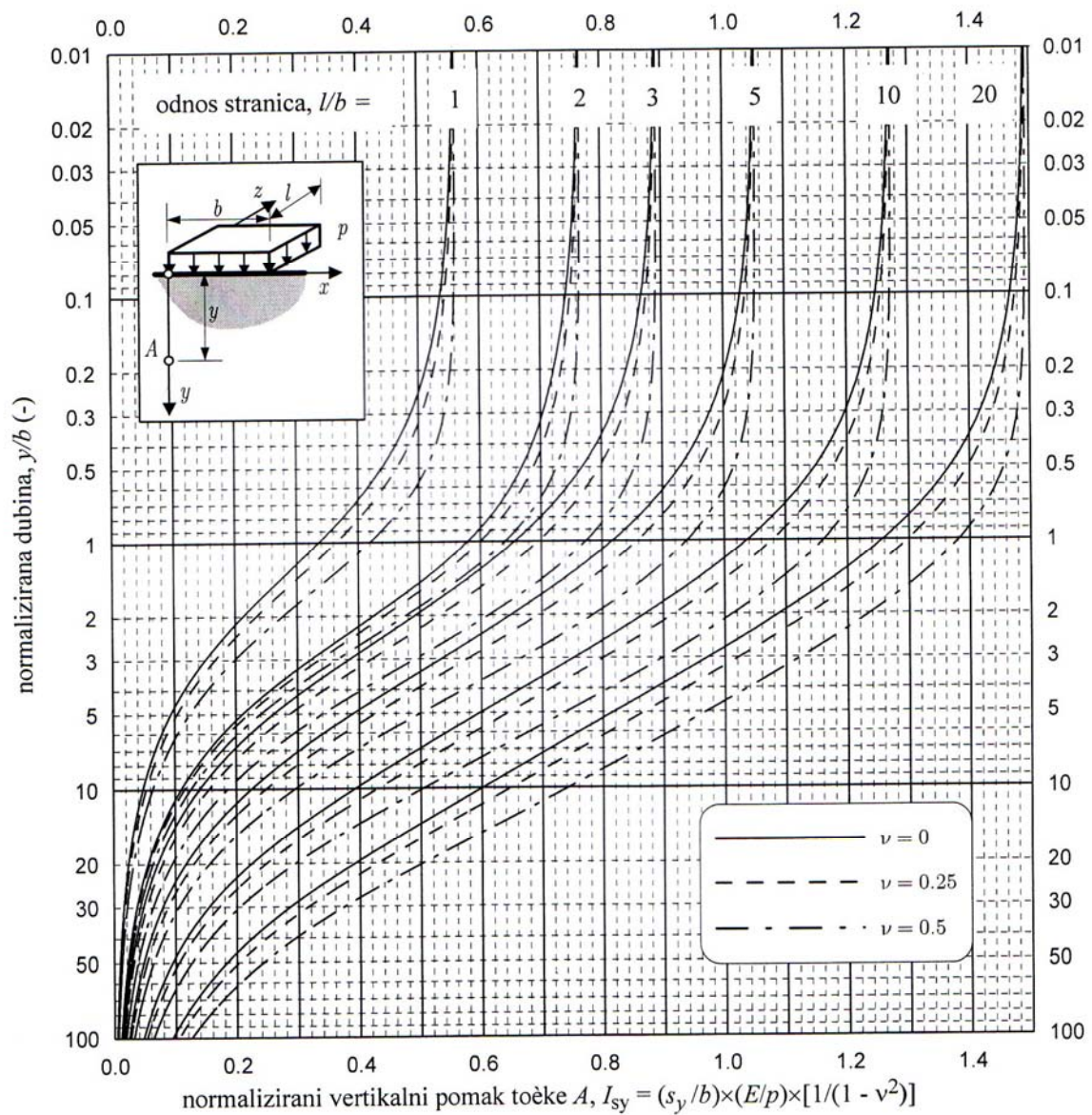


b)

$$E(MN/m^2) = f_2 N_{60}$$



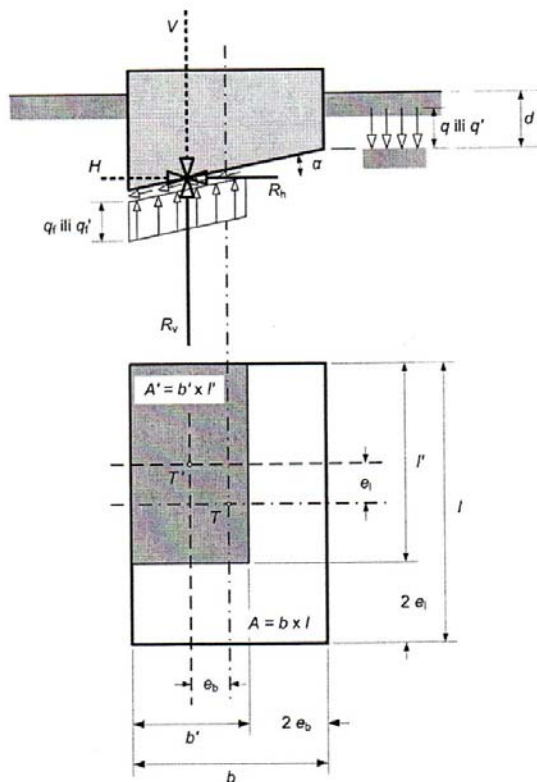
**Slika 9.** Preporuke za određivanje čvrstoće i krutosti krupnozrnatih tla. a) kut unutarnjeg trenja  $\varphi$  (Peck 1974); b) Youngov modul elastičnosti  $E$  (Stroud 1989).  $q_{\text{nett}}$  – karakteristična vrijednost kontaktnog naprezanja ispod temelja;  $q_{\text{ult}}$  – karakteristična nosivost temeljnog tla).



$$\Delta s_{yi} = pB \frac{1 - \nu_i^2}{E_i} \Delta I_{syi}$$

**Slika 10.** Proračun slijeganja vrha temelja po metodi prema Mayne & Poulos.

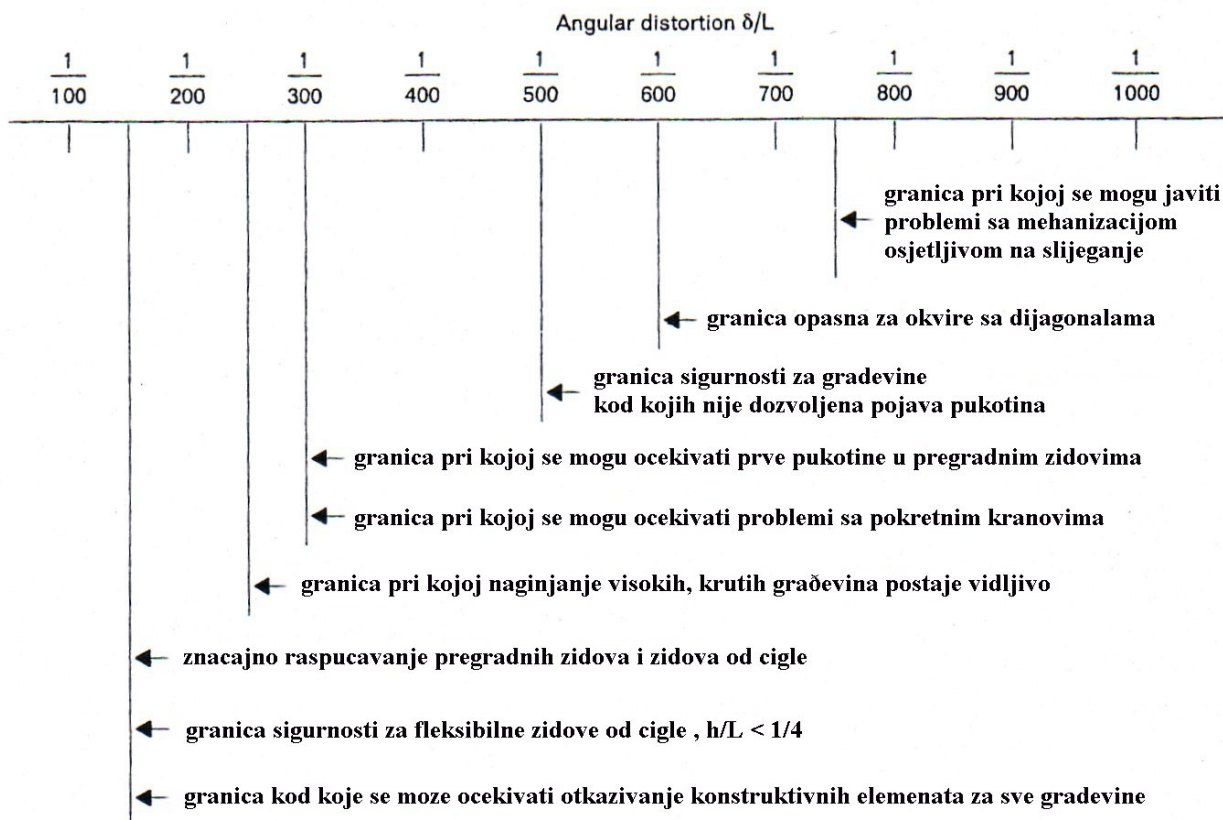




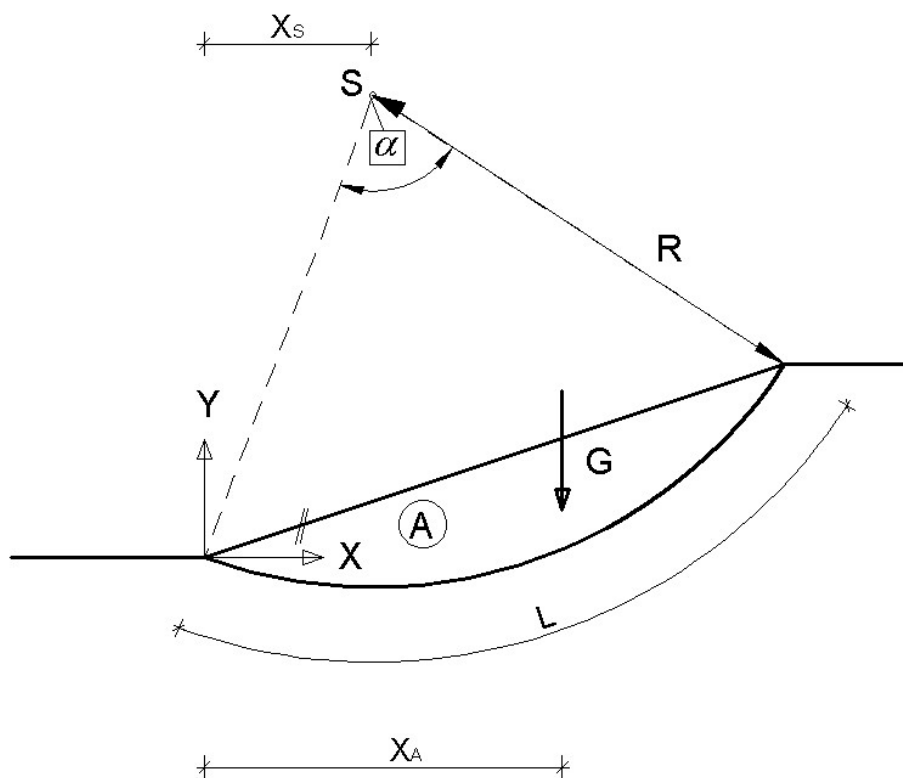
$$\frac{R}{A'} = q'_f = c' N_c b_c s_c i_c + q' N_q b_q s_q i_q + \frac{1}{2} \gamma' b' N_\gamma b_\gamma s_\gamma i_\gamma$$

član	izraz	
	nedrenirano	drenirano
$N_q$	1	$\tan^2\left(45^\circ + \frac{\varphi'}{2}\right) e^{\pi \tan \varphi'}$
$b_q$	1	$(1 - \alpha \tan \varphi')^2$ ; $\alpha$ izraženo u radijanima
$s_q$	1	$1 + \frac{b'}{l'} \sin \varphi'$
$i_q$	1	$[1 - H/(V + A' c' \cot \varphi')]^m$ $m = m_b = [2 + \frac{b'}{l'}] / [1 + \frac{b'}{l'}]$ kad $H$ djeluje u smjeru $b$ $m = m_l = [2 + \frac{l'}{b'}] / [1 + \frac{l'}{b'}]$ kad $H$ djeluje u smjeru $l$ ; kad $H$ djeluje pod kutom $\theta$ u odnosu na $l$ , tada je $m = m_\theta = m_l \cos^2 \theta + m_b \sin^2 \theta$
$N_c$	$2 + \pi$	$(N_q - 1) \cot \varphi'$
$b_c$	$1 - 2\alpha / (\pi + 2)$	$b_q - (1 - b_q) / (N_c \tan \varphi')$
$s_c$	$1 + 0.2 \frac{b'}{l'}$	$(s_q N_q - 1) / (N_q - 1)$
$i_c$	$\frac{1}{2} \left(1 + \sqrt{1 - \frac{H}{A' c_u}}\right)$	$i_q - (1 - i_q) / (N_c \tan \varphi')$
$N_\gamma$	0	$2(N_q - 1) \tan \varphi'$
$b_\gamma$	-	$b_q$
$s_\gamma$	-	$1 - 0.3 \frac{b'}{l'}$
$i_\gamma$	-	$[1 - H/(V + A' c' \cot \varphi')]^{m+1}$ ; $m$ kao za $i_q$

**Slika 11.** Proračun nosivosti temelja samca opterećenog kosim ekscentričnim opterećenjem



**Slika 12.** Granične vrijednosti rotacije objekta kod kojih dolazi do različitih tipova oštećenja objekta (prema EC7).



### ZADANO:

$R$  – radijus klizne plohe [m]

$A$  – površina kliznog tijela [ $\text{m}^2$ ]

$x_s$  – koordinata  $x$  točke rotacije kliznog tijela [m]

$x_A$  – koordinata  $x$  središta kliznog tijela [m]

$c_u$  – nedrenirana čvrstoća na kliznoj plohi [ $\text{kN}/\text{m}^2$ ]

$\alpha$  – kut klizne plohe [ $^\circ$ ]

### RAČUNA SE:

$G$  – težina kliznog tijela

$$G = \gamma_{\text{ta}} \cdot A \quad [\text{kN}]$$

$L$  – duljina klizne plohe (kružnog luka) [m]

$$L = \frac{R \cdot \pi \cdot \alpha}{180}$$

$\tau_f$  – posmični otpor na kliznoj plohi

$$\tau_f = c_u \cdot L$$

**Slika 13.** Proračun stabilnosti kosine kružne klizne plohe.

## Koeficijent aktivnog tlaka

Ako  $\beta \leq \varphi - \theta$

$$K_{AE} = \frac{\sin^2(\alpha + \varphi - \theta)}{\cos \theta \sin^2 \alpha \sin(\alpha - \delta_a - \theta) \left[ 1 + \sqrt{\frac{\sin(\varphi + \delta_a) \sin(\varphi - \beta - \theta)}{\sin(\alpha - \delta_a - \theta) \sin(\alpha + \beta)}} \right]^2}$$

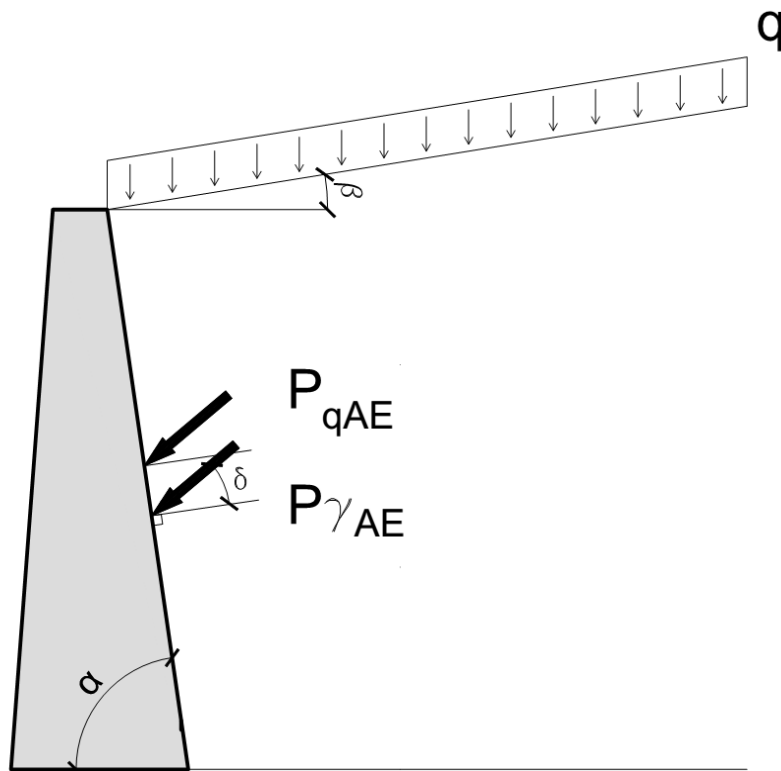
Ako  $\beta > \varphi - \theta$

$$K_{AE} = \frac{\sin^2(\alpha + \varphi - \theta)}{\cos \theta \sin^2 \alpha \sin(\alpha - \delta_a - \theta)}$$

$$\operatorname{tg} \theta = \frac{k_h}{1 \mp k_v} \quad \text{Zasip je suh}$$

$$\operatorname{tg} \theta = \frac{\gamma}{\gamma - \gamma_w} \frac{k_h}{1 \mp k_v} \quad \text{Voda prisutna u zasipu}$$

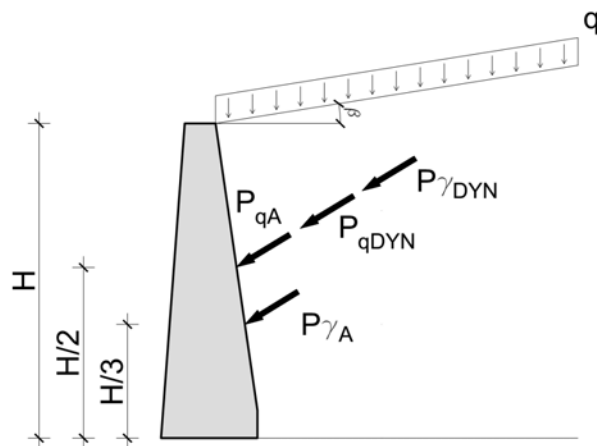
## Gravitacijski i gabionski zidovi



$\delta_a$  – koeficijent trenja na kontaktu gravitacijskog zida ili gabiona i tla  
 =  $\varphi$  (za gravitacijske zidove betonirane na terenu i gabionske zidove)  
 =  $2/3 \varphi$  (za montažne betonske elemente  
 ili naknadno zasipavanje tla iza gravitacijskog zida)

Nagib sile  $P_A$  u odnosu na okomicu na poledinu zida  
 $\delta_a$  - za gabionske i gravitacijske zidove





$$P_{\gamma AE} = \frac{1}{2} \gamma' (1 \pm k_v) H^2 K_{AE}$$

$$P_{qAE} = qHK_{AE}$$

$$P_{\gamma A} = \frac{1}{2} \gamma' H^2 K_A$$

$$P_{qA} = qHK_A$$

$$P_{\gamma DYN} = P_{\gamma AE} - P_{\gamma A}$$

$$P_{qDYN} = P_{qAE} - P_{qA}$$

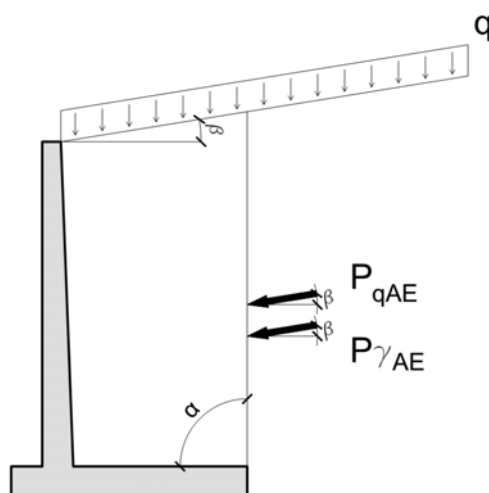
Komponente sila pritiska

$$P_{A\gamma H} = P_A \cos(90 - \alpha + \delta_a) \quad P_{AqH} = P_A \cos(90 - \alpha + \delta_a)$$

$$P_{A\gamma V} = P_A \sin(90 - \alpha + \delta_a) \quad P_{AqV} = P_A \sin(90 - \alpha + \delta_a)$$

$\gamma'$  – efektivna (uronjena) zapremninska težina tla [ $\text{kN/m}^3$ ]

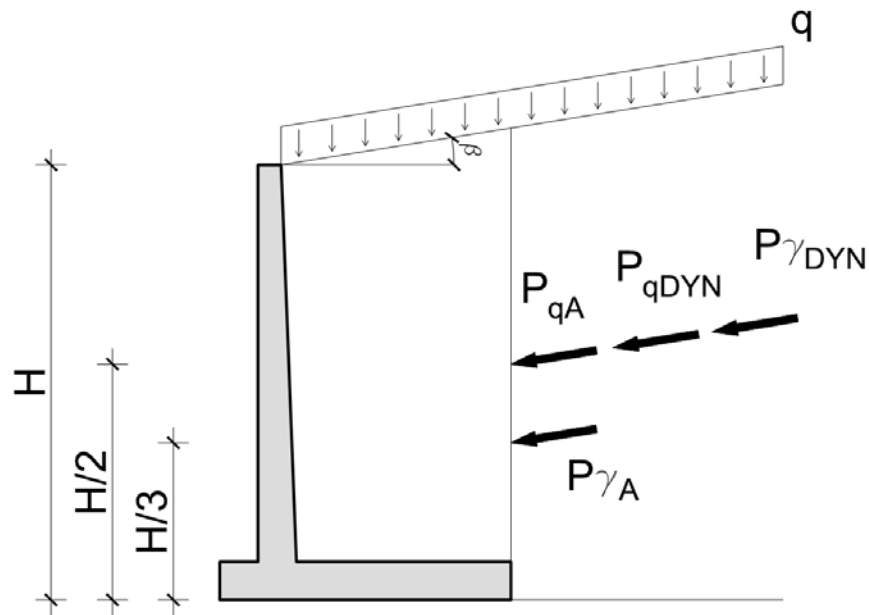
Konzolni zidovi



$$\delta_a = 0$$

$$\alpha = 90^\circ$$

Nagib sile  $P_A$  u odnosu na okomicu na virtualnu poledinu zida  
 $\beta$  - za konzolne zidove



$$P_{\gamma AE} = \frac{1}{2} \gamma' (1 \pm k_v) H^2 K_{AE}$$

$$P_{qAE} = qHK_{AE}$$

$$P_{\gamma A} = \frac{1}{2} \gamma' H^2 K_A$$

$$P_{qA} = qHK_A$$

$$P_{\gamma DYN} = P_{\gamma AE} - P_{\gamma A}$$

$$P_{qDYN} = P_{qAE} - P_{qA}$$

Komponente sila pritiska - konzolni zidovi

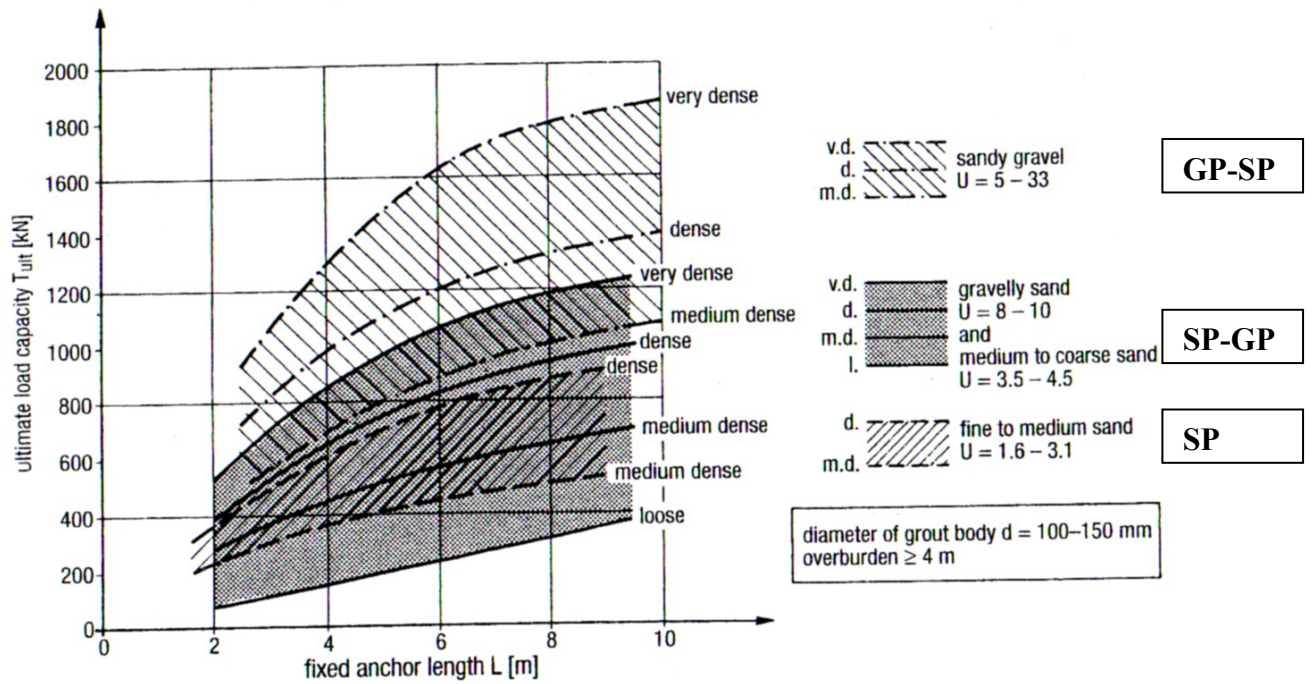
$$P_{A\gamma H} = P_A \cos(90 + \beta)$$

$$P_{AqH} = P_A \cos(90 + \beta)$$

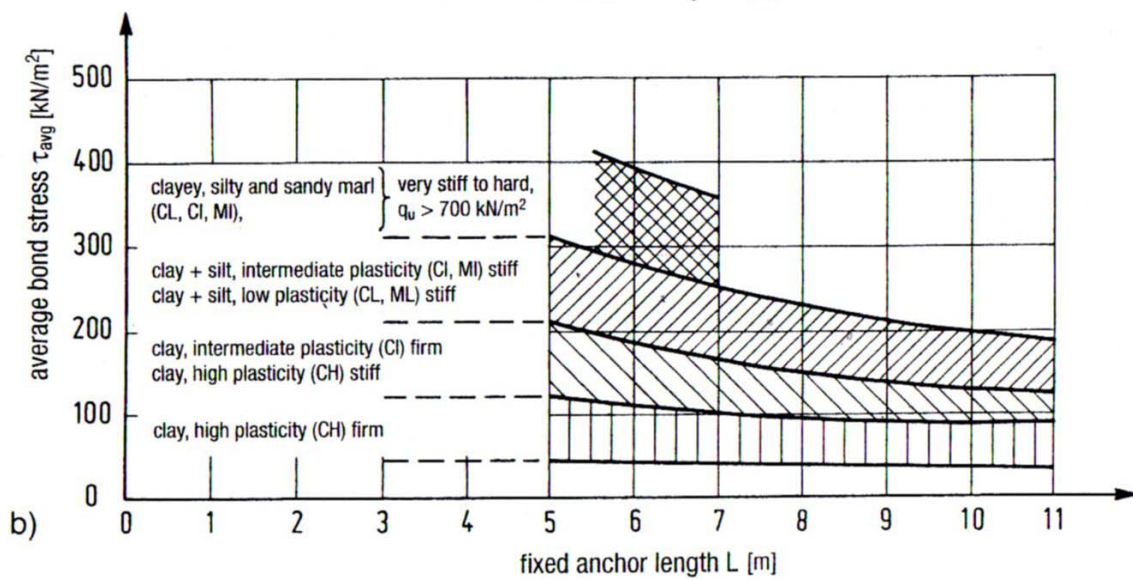
$$P_{A\gamma V} = P_A \sin(90 + \beta)$$

$$P_{AqV} = P_A \sin(90 + \beta)$$

$\gamma'$  – efektivna (uronjena) zapreminska težina tla [kN/m<sup>3</sup>]



a)



b)

Slika 14. Nosivost sidara za a) krupnozrnata tla; b) sitnozrnata tla (Smolczyk 2003).

KOHERENTNA TLA (glina C, prah M) $c = c_u ; \varphi = 0$	NEKOHERENTNA TLA (šljunak G, pijesak S) $c = 0 ; \varphi \neq 0$										
<b>Specifičan otpor na stopi pilota izražen na glavi pilota (za bušene pilote)</b>											
$q_b = N_c \cdot c_u$ <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;"><math>c_u</math> [kN/m<sup>2</sup>]</td> <td style="text-align: center;"><math>N_c</math></td> </tr> <tr> <td style="text-align: center;">25</td> <td style="text-align: center;">6,5</td> </tr> <tr> <td style="text-align: center;">50</td> <td style="text-align: center;">8,0</td> </tr> <tr> <td style="text-align: center;">100</td> <td style="text-align: center;">8,7</td> </tr> <tr> <td style="text-align: center;">200</td> <td style="text-align: center;">9,0</td> </tr> </table> <p style="text-align: center;"><math>c_u</math> – nedrenirana čvrstoća</p>	$c_u$ [kN/m <sup>2</sup> ]	$N_c$	25	6,5	50	8,0	100	8,7	200	9,0	$q_b [kN / m^2] = 60 \cdot N_{60} \cdot \frac{d}{10b} \quad \text{za } \frac{d}{b} \leq 10$ $q_b [kN / m^2] = 60 \cdot N_{60} \quad \text{za } \frac{d}{b} > 10$ <p style="text-align: center;"><math>N_{60}</math> – broj udaraca SPT reduciran na 60% teoretske energije zabijanja</p>
$c_u$ [kN/m <sup>2</sup> ]	$N_c$										
25	6,5										
50	8,0										
100	8,7										
200	9,0										
<b>Specifičan otpor po plaštu (za bušene pilote)</b>											
'ALFA' postupak	'BETA' postupak										
$q_s = \alpha \cdot c_u$ <p><math>\alpha = 0,55</math> za <math>\frac{c_u}{p_{atm}} \leq 1,5</math></p> <p><math>\alpha = 0,55 - 0,1 \left( \frac{c_u}{p_{atm}} - 1,5 \right)</math> za</p> <p><math>1,5 \leq \frac{c_u}{p_{atm}} \leq 2,5</math></p> <p><math>p_{atm}</math> – atmosferski pritisak (100 kN/m<sup>2</sup>)</p>	$q_s = \beta \cdot \sigma'_{ysr}$ <p><math>\sigma'_{ysr}</math> - vertikalno efektivno naprezanje u sredini lamele za koju računamo trenje</p> <p>- za pijeske:</p> <p><math>N_{60} \leq 15</math></p> $\beta = \frac{N_{60}}{15} \left( 1,5 - 0,25 \sqrt{y_{sr}} \right)$ <p><math>N_{60} &gt; 15</math></p> <p><math>\beta = 1,2</math>, za <math>y_{sr} &lt; 2,25</math> m</p> <p><math>\beta = 1,5 - 0,25 \sqrt{y_{sr}}</math>, za <math>2,25 &lt; y_{sr} &lt; 26,14</math></p> <p><math>\beta = 0,25</math>, za <math>y_{sr} \geq 26,14</math> m</p> <p>- za šljunke:</p> <p><math>\beta = 1,8</math>, za <math>y_{sr} \leq 1,47</math> m</p> <p><math>\beta = 2,0 - 0,15 (y_{sr})^{0,75}</math>, za <math>1,47 &lt; y_{sr} &lt; 26,46</math></p> <p><math>\beta = 0,25</math>, za <math>y_{sr} \geq 26,14</math> m</p> <p>- za vlačno opterećene pilote:</p> $q_{sVLAk} \approx 0,75 q_{sTLAK}$										

**Slika 15.** Postupak proračuna nosivosti pilota prema revidiranoj API-metodi.



KARAKTERISTIČNA NOSIVOST PILOTA: 
$$R_k = \min \left\{ \frac{R_{srednje}}{\xi_i}; \frac{R_{minimalno}}{\xi_j} \right\}$$

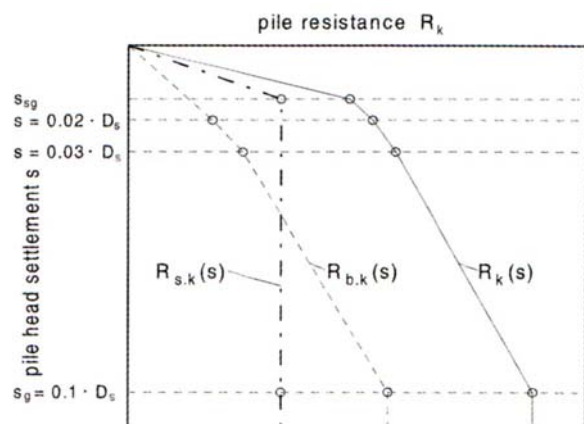
Tablica 8 Korelacijski faktori  $\xi$  za određivanje karakterističnih otpornosti za pilote

iz statičkog probnog opterećenja pilota;								
broj ispitanih pilota		n = 1	2	3	4	≥5		
$\xi_1$	( $i = 1, j = 2$ )	1.40	1.30	1.20	1.10	1.00		
$\xi_2$		1.40	1.20	1.05	1.00	1.00		
iz parametara tla;								
broj sondažnih profila tla		n = 1	2	3	4	5	7	10
$\xi_3$	( $i = 3, j = 4$ )	1.40	1.35	1.33	1.31	1.29	1.27	1.25
$\xi_4$		1.40	1.27	1.23	1.20	1.15	1.12	1.08
iz dinamičkih udarnih pokusa;								
broj ispitanih pilota		n = ≥2	≥5	≥10	≥15	≥20		
$\xi_5$	( $i = 5, j = 6$ )	1.60	1.50	1.45	1.42	1.40		
$\xi_6$		1.50	1.350	1.30	1.25	1.25		

PRORAČUNSKA NOSIVOST PILOTA: 
$$R_d = \frac{R_k}{\gamma_R} \text{ ili } \left( \frac{R_{ks}}{\gamma_s} + \frac{R_{kB}}{\gamma_B} \right)$$

Slika 16. Primjena korelacijskog koeficijente i parcijelnih koeficijenata nosivosti pilota.

		$R_b / R_{b,max}$	
$s / D_s$	$R_b$	S, G	C, M
2 %	$R_{b,002}$	0,37	0,77
3 %	$R_{b,003}$	0,51	0,88
10 %	$R_{b,010}$	1,00	1,00
s – slijeganje glave pilota			
$D_s$ – promjer pilota			
$R_b$ – otpor na bazi pilota za pomak s			
$R_{b,max}$ – nosivost baze pilota			
$s_{sg} (cm) = 0,5 \cdot R_s (MN) + 0,5 < 3,0cm$			



Slika 17. Postupak proračuna slijeganja pilota prema revidiranoj API-metodi.

### NOSIVOST GRUPE PILOTA:

$$R_{grupa} = R_{pilot} \times m \times n \times \eta$$

$m, n$  – broj redova, stupaca grupe pilota

$\eta$  – faktor redukcije nosivosti

#### a) Converse – Labarre

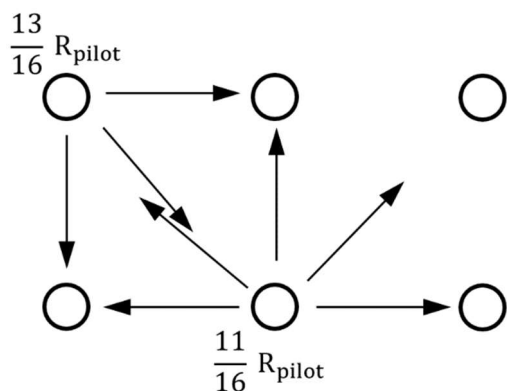
$$\eta = 1 - \psi \cdot \left[ \frac{(n-1) \cdot m + (m-1) \cdot n}{90 \cdot m \cdot n} \right]$$

$$tg \psi = \frac{b}{a}$$

$b$  – promjer pilota

$a$  – razmak između redova i stupaca

#### b) Feld



$$\eta = \frac{\text{suma koeficijenata redukcije nosivosti}}{m \cdot n}$$

$$\frac{k}{16} \text{ – koeficijent redukcije nosivosti}$$

– nosivost svakog pilota u grupi smanjuje se za 1/16 po svakom susjednom pilotu

### SLIJEGANJE GRUPE PILOTA:

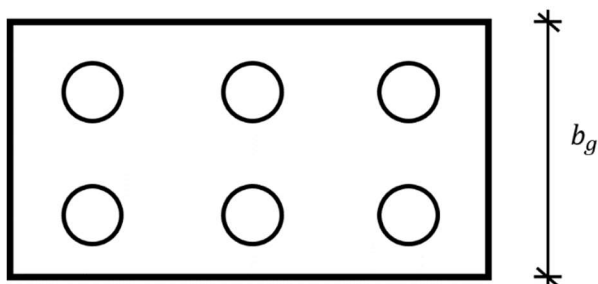
$$S_{grupa} = S_{pilot} \times \eta$$

$$\eta = \frac{4 \cdot \frac{b_g}{b} + 9}{\frac{b_g}{b} + 12}$$

$b_g$  – širina grupe

$b$  – promjer pilota

$\eta$  – faktor slijeganja



Slika 18. Postupak proračuna nosivosti i slijeganja grupe pilota

Ground type	Description of stratigraphic profile	Parameters		
		$v_{s,30}$ (m/s)	$N_{SPT}$ (blows/30cm)	$c_u$ (kPa)
A	Rock or other rock-like geological formation, including at most 5 m of weaker material at the surface	> 800	–	–
B	Deposits of very dense sand, gravel, or very stiff clay, at least several tens of m in thickness, characterised by a gradual increase of mechanical properties with depth	360 – 800	> 50	> 250
C	Deep deposits of dense or medium-dense sand, gravel or stiff clay with thickness from several tens to many hundreds of m	180 – 360	15 - 50	70 - 250
D	Deposits of loose-to-medium cohesionless soil (with or without some soft cohesive layers), or of predominantly soft-to-firm cohesive soil	< 180	< 15	< 70
E	A soil profile consisting of a surface alluvium layer with $v_s$ values of type C or D and thickness varying between about 5 m and 20 m, underlain by stiffer material with $v_s > 800$ m/s			
$S_1$	Deposits consisting – or containing a layer at least 10 m thick – of soft clays/silts with high plasticity index (PI > 40) and high water content	< 100 (indicative)	–	10 - 20
$S_2$	Deposits of liquefiable soils, of sensitive clays, or any other soil profile not included in types A – E or $S_1$			

a)

Ground type	$S$	$T_B$ (s)	$T_C$ (s)	$T_D$ (s)
A	1,0	0,15	0,4	2,0
B	1,2	0,15	0,5	2,0
C	1,15	0,20	0,6	2,0
D	1,35	0,20	0,8	2,0
E	1,4	0,15	0,5	2,0

b)

Type of retaining structure	$r$
Free gravity walls that can accept a displacement up to $d_r = 300 \alpha \cdot S$ (mm)	2
Free gravity walls that can accept a displacement up to $d_r = 200 \alpha \cdot S$ (mm)	1,5
Flexural reinforced concrete walls, anchored or braced walls, reinforced concrete walls founded on vertical piles, restrained basement walls and bridge abutments	1

c)

**Slika 19.** Seizmički geotehnički proračun. a) Tipovi tla prema seizmičnosti; b) vrijednosti parametara elastičnog spektra odziva tipa 1; c) parametar horizontalnog koeficijenta seizmičnosti ovisno o vrsti potpornog zida i dozvoljenoj teformaciji uslijed potresa.